Lesson Context

BIG PICTURE of this UNIT:	• mastery with algebraic skills to be used in our work with co-ordinate geometry (midpoint, length, slope) • understanding various geometric properties of quadrilaterals & triangles • how do you really "prove" that something is "true"?

(A) **Lesson Objectives:**

a. Investigate various isometric (and non-isometric) transformations of shapes and functions using geogebra

(B) **Translations**

a. Create a quadrilateral in which all four vertices initially lie in the first quadrant (but not on the x- or y-axis). Record the original vertices on the table below.
b. Create a vector (start it at (0,0) and end it wherever you wish – but make sure that you and your partners have different vectors.) Record this translation vector on the table below.
c. Translate the quadrilateral using your vector.
d. Record the vertices of the new "image" of you quadrilateral
e. Repeat for two additional translation vectors and record the information on the table as well.

Original Quadrilateral	Translation Vector	Coordinates of Image Quadrilateral

f. Now write a generalization ➔ if the translation vector $\begin{pmatrix} h \\ k \end{pmatrix}$ is applied to a point of (x,y), then the coordinates of the new image point will be _____.

(C) **Reflections**

a. Create a quadrilateral in which all four vertices initially lie in the first quadrant (but not on the x- or y-axis). Record the original vertices on the table below.
b. Find the transformations tool on the toolbar (3rd last one) and select the Reflect about Line option.
c. Reflect your quadrilateral across the x-axis.
d. Record the vertices of the new "image" of you quadrilateral
e. Reflect your original quadrilateral across the y-axis. Record the vertices of the new "image".
f. Create the line $y = x$.
g. Now reflect your quadrilateral across the line $y = x$ and record the image location on the table as well.

Original Quadrilateral	Reflection axis	Coordinates of Image Quadrilateral

h. Now write a generalization ➔ if the point of (x, y) is reflected across the x-axis, then the coordinates of the new image point will be _____.

i. Now write a generalization ➔ if the point of (x, y) is reflected across the y-axis, then the coordinates of the new image point will be _____.

j. Now write a generalization ➔ if the point of (x, y) is reflected across the line $y = x$, then the coordinates of the new image point will be _____.

k. HL EXTENSION: What would happen if you reflected your image across the line $y = mx + b$?

(D) **Rotations**

a. Create a quadrilateral in which all four vertices initially lie in the first quadrant (but not on the x- or y-axis and make sure that the c co-ordinate is different than the y coordinate). Record the original vertices on the table below.
b. Find the transformations tool on the toolbar (3rd last one) and select the Rotate about a Point option.
c. Enter the point (0,0)
d. Rotate your quadrilateral 90°. Record the vertices of the new "image" of you quadrilateral.
e. Rotate your original quadrilateral 180°. Record the vertices of the new "image" of you quadrilateral
f. Rotate your original quadrilateral 270°. Record the vertices of the new "image" of you quadrilateral

Original Quadrilateral	Rotation Angle	Coordinates of Image Quadrilateral

g. Now write a generalization ➔ if the point of (x,y) is rotated 90°, then the coordinates of the new image point will be _____.

h. Now write a generalization ➔ if the point of (x,y) is rotated 180°, then the coordinates of the new image point will be _____.

i. Now write a generalization ➔ if the point of (x,y) is rotated 270°, then the coordinates of the new image point will be _____.

j. HL EXTENSION: What would happen if your quadrilateral is rotated 45°? 60°?